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Amino Acid and Mineral Salt Content of Tomato Seed and Skin Waste

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Tomato seeds and skins from tomato pomace were analysed for their content of protein, ether extract, ash, crude fibre, total sugars, amino acids and several minerals. Protein hydrolysates from both the seeds and peels showed the presence of eighteen amino acids. K, P, Mg, Ca, Na and Cl were predominant among the minerals. Fe, Mn, Cu and Zn were found to be present in smaller quantities.

1. Introduction

Tomato pomace, dehydrated tomato pulp consisting principally of seeds and skins, is a waste product from the food canning industry and finds use for animal feeding.[1] Values for proximate composition of tomato pomace have been determined,[1,2] but there has been relatively little research done on the amino acid and mineral contents of its components. Gad *et al.*[3] found 17 amino acids in the tomato seed by paper chromatography. Lech *et al.*[4] examined the chemical composition of tomato wastes and found that the amino acid content and nutritive value of the seed protein was similar to that of soybean and sunflower proteins.

Production of tomato purée is now expanding in Greece, and tomato seed and skin wastes are discarded in considerable amounts. This work was undertaken to supplement the existing data on the amino acid and mineral composition of tomato canning waste products and to appraise their value.

2. Experimental

Samples of tomato pomace (Variety Roma) were obtained during the commercial extraction of mature tomatoes grown in Northern Greece (Federation of Agricultural Cooperatives, Thessaloniki). The samples were partially dried and the seeds were removed by hand. For the determination of ether extract, ash, fibre, sugars and nitrogen the official AOAC[5] methods were used. Analysis of amino acids was carried out using a JEOL model JLC-5AH automatic amino acid analyser. Tryptophan was determined colorimetrically[6] in the seed samples only. For the analysis of minerals, volumetric,

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Table 1. Chemical composition and mineral content of tomato seeds and skins

Samples	g/100 g dry sample					mg/100 g dry sample									
	Ash	Crude fibre	Total sugars (as glucose)	Protein (N × 6.25)	Ether extract	K	Na	Ca	Mg	P	Cl	Fe	Mn	Cu	Zn
Seeds	5.4	19.1	2.9	24.5	28.1	780	110	160	300	690	110	17	6	2	5
Skins	2.7	55.9	7.8	10.0	3.6	1100	95	210	115	130	210	15	2	3	3

Table 2. Amino acid content of tomato seeds and skins

Amino acids	g/100 g of protein[a] Seeds	Skins
Lysine	4.94	4.41
Histidine	2.20	1.46
Arginine	8.83	3.88
Aspartic acid	9.58	10.60
Threonine	3.01	4.67
Serine	4.98	5.89
Glutamic acid	18.49	15.14
Proline	5.39	4.98
Glycine	4.64	7.56
Alanine	3.72	3.89
Half cystine	0.60	0.49
Valine	3.70	5.00
Methionine	0.78	0.75
Isoleucine	3.52	2.78
Leucine	5.86	5.06
Tyrosine	3.38	2.61
Phenylalanine	3.64	3.08
Tryptophan	0.95	

[a] Protein: N × 6.25.

colorimetric, flame photometric and atomic absorption (Perkin–Elmer model 303) spectrophotometric methods were used.

3. Results and discussion

The results are presented in Tables 1 and 2.

All the amino acids reported by Gad *et al.*[3] were present in the seeds. Amino acid composition of the latter agrees in general with that reported by Lech *et al.*[4] Values for cystine and methionine were lower in the Greek samples but this is probably due to extensive destruction during acid hydrolysis. Significant differences were shown between the results reported here and those of the above investigator[4] in most of the minerals considered. This variation may be attributed to varietal difference and origin of samples.

The results show that tomato wastes are rich in nutrients. The amino acid content of tomato seeds should make them a valuable addition to feeds for animals or a potential source of commercial protein; this could be important for the economics of tomato waste utilisation.

References

1. Morrison, B. F. *Feeds and Feeding* 1961, 9th edn., p. 604, Clinton-Iowa, The Morrison Publishing Company.
2. Kent-Jones, D. W.; Amos, A. J. *Modern Cereal Chemistry* 1967, p. 483, London, Food Trade Press Ltd.
3. Gad, A. M.; El-Khalafy, H. M.; Hassan, M. M.; Shoeb, Z. E. *Grasas Aceites* 1968, 19, 139.
4. Lech, W.; Muszkatowa, B.; Kakowska-Lipinska, I. Trzebska-Jeske, I. *Przem. Spozyw.* 1969, 23, 161.
5. *Official Methods of Analysis* 1964, 9th edn., Washington DC, Ass. of Official Agric. Chem.
6. Jamalian, J.; Pellet, P. L. *J. Sci. Fd Agric.* 1968, 19, 378.